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TITLE: Virtual cosmetic autosurgery via telemedicine

Abstract Paragraph (1):

A method and apparatus for performing virtual cosmetic surgery by inputting a patient's image, personal data, and proposed image modification scheme into one of a plurality of remote computers, with the image and the modification scheme being analyzed and modified by a central computer, thereafter displaying a modified patient image at the remote computer, with the central computer being connected to the plurality of such remote computers via the Internet.

Summary of Invention Paragraph (9):

[0008] To facilitate the education process of a person interested in cosmetic plastic surgery, several companies have introduced computer software programs which have the capability of modifying the appearance of a prospective patient. These simulation and morphing software programs are commercially targeted for offices of surgeons performing cosmetic and plastic procedures, and constitute a useful tool in helping patients to better understand a particular cosmetic procedure and the effect of that procedure on the patient's final postoperative appearance, should surgery be elected by the patient.

Summary of Invention Paragraph (10):

[0009] A leading system for cosmetic surgery simulations is called the Mirror Suite.TM. Total Patient Imaging Software. A surgeon's office with this system is able to have patients watch on screen as they are guided from their current appearance to a representative post-operative outcome (www.canfieldsci.com). Employing morphing and simulation tools, the Mirror Suite.TM. imaging system is applicable for resurfacing simulation, hair restoration tools, hair loss simulation, and image management. Also provided are draw and warp tools, and tools for simulated breast augmentation.

Summary of Invention Paragraph (11):

[0010] The Canfield Mirror Suite.TM. software system can be incorporated with the Canfield DermaGraphix.TM. Dermatology Imaging Software system, which offers dermatologists a complete digital imaging system, utilized for serially tracking over time skin lesions located on the body of a patient. This system is used for pigmented lesions, and body mapping is also useful for documenting psoriasis, eczema and other conditions. Images purportedly can be compressed sufficiently to be sent via e-mail or posted on a web page.

Summary of Invention Paragraph (12):

[0011] No description is made in the Canfield website or brochures, however, of a patient having the ability to automodulate his or her own appearance completely automatically and completely on-line via the Internet or other long-distance carrier, without an intervening technician or other support personnel. In the Canfield system, then, it is not the patient, but the technician who is in charge of the simulation and morphing functions.

Summary of Invention Paragraph (13):

[0012] Another company involved in an imaging and archiving system for the plastic and cosmetic surgical arena is United Imaging, Inc., which commercially offers its MarketWise.TM. Imaging and Archiving System. Featuring a high resolution camera,

patient photographs can be taken (www.uimaging.com). A color LCD on the camera can allow for instant review of images and shows camera settings for each image. The color LCD on the digital camera typically operates in live mode until the picture is snapped. Voice files may be saved with each picture. The MarketWise.TM. Imaging Systems have specially designed programs for simulation of hair replacement, laser resurfacing, and upper blepharoplasty. MarketWise.TM. Imaging includes advanced tools for cloning, morphing, and symmetrical morphing. Volumetric morphing simulates breast enlargement and reduction. An automorph function allows morphing without first defining a region. Using computer imaging as an integral part of the consultation process is a proven practice builder, adding increased patient understanding and the confidence to proceed with proposed procedures.

Summary of Invention Paragraph (17):

[0016] The Niamtu Imaging System software is also available (www.niamtu.com). The website describes software including the TMS (Total Image Management) professional image editing, presentation software, sophisticated archiving software, image capture software, global viewing software, fast formatting, web tools, the ability to add pictures to referral letters, and others. For orthodontic and cosmetic formatting, Niamtu Imaging System is especially designed for Windows 95 and 98 and Microsoft Office. Using this system, the purchaser is able to perform a variety of tasks, including "pick and apply" editing which facilitates real-time imaging changes. Images can be dragged and dropped into referral letters and other documents. The system has autoproccessing tools which automatically straighten, crop, focus, and adjust for color and brightness with the click of a mouse. It also has other special effects that allow a surgeon to create Internet pages, and to catalogue any image from a patient to an art collection. Included is a tool for morphing. The system is useful for laser resurfacing, as well as being useful for orthodontic and cosmetic surgery formatting. Web tools are also provided to create web pages. The system is available on CD-ROM only, with an instructional video and manual. A digital camera is recommended for capturing digital images.

Summary of Invention Paragraph (18):

[0017] A section of the Niamtu website entitled "The Magic of Image Morphing," states that the software will automatically redraw changes made by the user, and the color, shadow and contrast will be calculated automatically, usually within seconds. Moving the control points redraws the image in real time. Morphing can be done on any anatomical area from breast to tooth. The user may also zoom in on a specific body part, such as the nose, chin, etc., and isolate the structure which gives the user more control points and more precise changes without disturbing the rest of the anatomy. Besides morphing, the Niamtu Imaging System allows the user to rotate any anatomy, including straightening a tooth or rotating a nasal tip. Text can also be added to any image.

Summary of Invention Paragraph (19):

[0018] The Niamtu website has a "Presentation and Marketing" section, and an "album function," which allows the user to place images in an album in thumbnail format. Once the images are saved to an album, the user can make multimedia slide shows using the images. These slide shows may be interfaced with programs like Microsoft Power Point to make custom lectures and professional publications. They can even be posted on the Internet. Additionally, the system provides for the development of custom databases, with which it is possible to categorize and retrieve images based upon specific search parameters, such as treatment complications from a specific procedure. Sophisticated "Image Archiving" is available with the Niamtu system, which allows the ability to store images in over 40 formats, such as jpg, bmp, tiff, gif, pcx and others. Compression is used to preserve hard drive memory.

Summary of Invention Paragraph (20):

[0019] The "Internet and Web Tools" section of the website indicates that, in the future, imaging will rely more and more on the World Wide Web. A SmartSaver tool is provided, which allows the user to optimize images so when placed on the Internet, they download quickly. The Niamtu system also offers other special effects.

Summary of Invention Paragraph (23):

[0022] The computer imaging section of this website is Internet-based, from the point of view that a person interested in cosmetic plastic surgery transmits a

scanned photograph on-line directed to the medical illustrators on the staff of the Plastic Surgery Company, and, after these professionals morph the original photographs, the new photographs depicting the possibilities of cosmetic improvement via the vehicle of plastic surgery are transmitted on-line back to the prospective candidate for surgery. At no time, however, do patients themselves have the opportunity to change their appearance or to experiment with the various simulation and morphing options.

Summary of Invention Paragraph (28):

[0026] The present invention of virtual cosmetic autosurgery via telemedicine constitutes a new way of performing surgical simulations and morphing. The patient is in complete command of the morphing and simulation functions, and, interestingly, such an individual is not only the patient, but also becomes the surgeon; hence, the term, "autosurgery." An image of the patient is provided to a central computer. The patient uses a remotely located computer to connect to the central computer, via a data transmission system, such as the Internet. The patient can then input other patient data, as well as inputting desired modifications to the patient's own image, such as a face lift or breast augmentation. The patient can view the results of the modifications on the remotely located computer. The present invention, in other words, provides the ability for the patient to be in control of directing the software which controls the simulation process. The patient at a distant site, in essence, becomes the "surgeon" and directs the chosen procedure via interactive discourse with the computer software system at the central processing site.

Detail Description Paragraph (2):

[0028] The present invention operates in the following manner. A patient scans one or more photographs of the face, or other area of the body contemplated for virtual cosmetic autosurgery, into a home or office computer. Generally, frontal and profile views are required for optimal and realistic results. Alternatively, a photograph is mailed in to a provider of the simulation services, or a video camera attached to an office or home computer digitally scans the patient's face or body directly into the computer's memory, obviating the need for a photograph to be available. The content of the software selects appropriate views, with the most useful being frontal and profile views. Three dimensional modeling, which requires 360 degree views for best results, could also be used. As video camera attachments become ubiquitous, this alternative is envisioned as the future preferred embodiment. Until such time as suitable-quality video cameras for attachment to computers become commonplace, however, pictures captured with either analog, or preferably, the newer digital cameras, will suffice to provide the platform for cosmetic plastic autosurgical simulations and morphings.

Detail Description Paragraph (3):

[0029] The digitized pictures obtained as described above are transmitted from the distant remote site, i.e., the home or office of the patient, to the company's central processing computer site, for example via long-distance carrier, preferably the Internet, and then appropriately calibrated and sized by the central site's system software, such that these will be compatible in size, position, and view angle for the surgical procedural options available. For instance, if one's nose is to undergo virtual cosmetic autosurgery, it is vital that the original photographs be proportioned and scaled in such a way that the virtual surgical nose options can be superimposed properly onto the original photographs. This requires proper sizing of the original photographs as the beginning first step. To elaborate, an individual may prefer, among other virtual surgical options, to have a "smaller" nose, a "bigger" nose, a more "pointed" nose, a "flatter" nose, a "straighter" nose, a "thinner" nose, a nose without a "hump," or a nose with a "hump," etc., but, in all of these cases, it is imperative that the original photographs be digitized and then automatically sized and proportioned in such a manner that uniformity and standardization are achieved. If thousands of persons simultaneously wish to perform realistic virtual autosurgery via telemedicine, such standardization is mandatory for the entire network to function properly and for patients to be able to assess accurately the results of their telemedicine virtual autosurgery. It would most highly undesirable, for instance, if a patient's new virtual autosurgical nose also covered his or her mouth, due to improper sizing of the original photograph.

Detail Description Paragraph (13):

[0039] Certainly, the patient may wish to take pictures or a floppy disc, or other suitable storage medium, of the finished autosurgical procedure to a qualified plastic or cosmetic surgeon, but there is certainly no need or pressure placed to do so. Consulting with a real-life plastic or cosmetic surgeon is entirely optional, based on an individual's wishes. This differs quite substantially from a doctor's in-office computer modeling consultations, which are typically performed in the surgeon's office by a technician. In these situations, patients generally may have either intended or unintended pressure exerted to have one, or another, surgical procedure.

Detail Description Paragraph (14):

[0040] The Plastic Surgery Company's strategy, described above, is "on-line," but the surgery is not autoperformed. Rather, trained technicians perform the virtual surgery over a 24-hour period, and then transmit the final result back to the patient via the Internet. At no time does the patient herself or himself have the on-line opportunity (or any opportunity) to self-operate. The final pictures are the by-product of the technician's ingenuity, personal biases, and views of the ideal, rather than, more democratically, representing the true wishes and desires of the patient, as is the case with the present invention. With the present invention, the patient herself or himself has the risk-free (and interesting) experience of performing autosurgery--all without physical risk and completely reversible with the push of a button, without pressure to sign up for real-live surgery--with real-live attendant risks--and with extremely minimal expense, such as a nominal on-line charge. Even an individual of limited means should be able to afford the present invention's telemetric virtual cosmetic autosurgery. A most novel aspect of the present invention, then, centers around a person's ability to interactively alter one's virtual appearance oneself via virtual telemedicine.

Detail Description Paragraph (22):

[0047] 3. Person at Distant Remote Site responds to questions posed by Central Processing Site computer in Step 2, and then transmits scanned photographs (or images from video camera) to Central Processing Site, which processes images into the proper predetermined standardized format for computerized morphing and simulation.

CLAIMS:

1. A self-performed virtual cosmetic surgery system, comprising: a plurality of computers at a plurality of remote sites, said plurality of remote computers each having a video display device and at least one input device; a computer at a central site, said central computer being programmed to receive original digital images of patients, to receive patient data, to receive patient image modification commands, to standardize said original patient images, to analyze said original patient images, to analyze said patient data, to analyze said patient image modification commands according to current medical protocols, and to generate modified digital patient images; and a data transmission system connected to transmit said image modification commands from said plurality of remote computers to said central computer, and to transmit said modified patient images from said central computer to said plurality of remote computers.

8. The virtual cosmetic surgery system recited in claim 1, wherein said central computer is further programmed to provide alternative image modification schemes to said plurality of remote computers.

9. The virtual cosmetic surgery system recited in claim 8, wherein said image modification scheme comprises a computerized scheme for modifying the size of a selected body part.

10. The virtual cosmetic surgery system recited in claim 8, wherein said image modification scheme comprises a computerized scheme for modifying the orientation of a selected body part.

12. The virtual cosmetic surgery system recited in claim 8, wherein said image modification scheme comprises a computerized selection of alternative configurations for a selected body part.

13. A self-performed virtual cosmetic surgery system, comprising: a plurality of computers at a plurality of remote sites, said plurality of remote computers each having a video display device, a patient image input device, and at least one data input device; a computer at a central site, said central computer being programmed to receive original digital images of patients via said patient image input device, to receive patient data via said at least one data input device, to receive patient image modification commands via said at least one data input device, to standardize said original patient images, to analyze said original patient images, to analyze said patient data, to analyze said patient image modification commands, according to current medical protocols, and to generate modified digital patient images; and a data transmission system connected to transmit said original digital patient images, said patient data, and said patient image modification commands from said plurality of remote computers to said central computer, and to transmit said modified patient images from said central computer to said plurality of remote computers.

14. A method for self-performance of virtual cosmetic surgery, comprising: providing a plurality of remote computers at a plurality of remotely located sites; providing a central computer at a central site; inputting an original digital image of a patient into said central computer; inputting data relative to said patient into said central computer; inputting image modification commands into said at least one remote computer; transmitting said image modification commands from said at least one remote computer to said central computer via a data transmission system; standardizing said original patient image with said central computer; analyzing said original patient image, said patient data, and said image modification commands, according to current medical protocols, with said central computer; generating a modified patient image with said central computer, according to said image modification commands; transmitting said modified patient image from said central computer to said at least one remote computer via a data transmission system; and displaying said modified patient image on a video display device connected to said at least one remote computer.

15. The virtual cosmetic surgery method recited in claim 14, wherein said standardizing of said original patient image comprises revising said image to a standard size to match image sizes for various alternative body part configurations.

16. The virtual cosmetic surgery method recited in claim 14, wherein said analysis of said original patient image, said patient data, and said image modification commands, comprises calculation of expected outcomes for image modification schemes selected by a particular patient.

17. The virtual cosmetic surgery method recited in claim 14, further comprising providing alternative image modification schemes to said plurality of remote computers, with said central computer.

18. The virtual cosmetic surgery method recited in claim 17, wherein said provision of alternative image modification schemes comprises providing a computerized scheme for modifying the size of a selected body part.

19. The virtual cosmetic surgery method recited in claim 17, wherein said provision of alternative image modification schemes comprises providing a computerized scheme for modifying the orientation of a selected body part.

21. The virtual cosmetic surgery method recited in claim 17, wherein said provision of alternative image modification schemes comprises providing a computerized selection of alternative configurations for a selected body part.

22. The virtual cosmetic surgery method recited in claim 14, further comprising inputting said original digital image of a patient into said central computer via said at least one remote computer and via said data transmission system.

23. The virtual cosmetic surgery method recited in claim 14, further comprising: providing a photograph of a patient to an operator of said central computer via a mail service; and inputting said original digital image of the patient into said

central computer via an image input device connected to said central computer.